

CLAIMS

What is claimed is:

1. A method to process video data dynamically, the method comprising:
 - adaptively filtering at least some high frequency components from video frames;
 - adaptively filtering texture information within object boundaries in an image in the video frames;
 - encoding these filtered video frames; and
 - dynamically adapting a property of either or both of the filterings based on a set of criteria, including feedback information from the encoding.
2. The method of claim 1 wherein dynamically adapting the property includes dynamically adapting a region of support of either one or both of the filterings based on the set of criteria.
3. The method of claim 1 wherein dynamically adapting the property includes dynamically adapting strength of either or both of the filterings based on the set of criteria.
4. The method of claim 1 wherein filtering the high frequency components comprises filtering these components from at least one of a selectable frame, macroblock, and block granularity.
5. The method of claim 1 wherein dynamically adapting the property of either or both of the filterings based on the set of criteria include dynamically adapting

based on at least one of quantization level, quantization history, motion velocity, changes in scene, number of consecutive frames skipped, and buffer fullness.

6. The method of claim 5, further comprising using a plurality of weighting factors for at least some of the criteria in the set.

7. The method of claim 1 wherein filtering at least some high frequency components includes low pass filtering the high frequency components.

8. The method of claim 1 wherein filtering texture information within object boundaries includes texture smoothing using a non-linear filter.

9. The method of claim 1 wherein dynamically adapting the property of the filtering includes determining whether to increase strength of the filtering based on whether a difference between old and new filter strengths is within a range.

10. The method of claim 9, further comprising using a lookup table to determine whether the difference is within the range.

11. The method of claim 1, further comprising performing additional processing to the video frames prior to encoding.

12. The method of claim 1, further comprising sharing at least some data between filtering processes respectively associated with multiple unique output video streams that are generated from a single input video stream during a single encoding session.

13. A method to process video data, the method comprising:

filtering high frequency information from at least some video frames having abrupt image changes;
smoothing texture information within object boundaries of an image in the video frames; and
adaptively changing, if necessary, a characteristic of either one or both of the filtering and smoothing in response to a set of criteria.

14. The method of claim 13 wherein adaptively changing the characteristic of the filtering includes reducing strength of the filtering as a human visual system adjusts to the image changes.

15. The method of claim 13 wherein adaptively changing the characteristic of either one or both the filtering and the smoothing includes changing the characteristic based on at least one of quantization level, quantization history, motion velocity, changes in scene, number of consecutive frames skipped, and buffer fullness.

16. The method of claim 13 wherein adaptively changing the characteristic includes adaptively changing a region of support of either one or both of the filtering and smoothing in response to the set of criteria.

17. The method of claim 13, further comprising maintaining a level of either one or both of the filtering and smoothing if a difference in level changes exceeds a range.

18. The method of claim 13 wherein either one or both of the filtering and smoothing is performed at a selectable one of a frame, block, and macroblock granularity.

19. The method of claim 13, further comprising adjusting influence of the criteria in the set using weighting factors.

20. The method of claim 13, further comprising:
performing additional processing of the video frames; and
encoding the video frames having the high frequency information filtered therefrom and having the smoothed texture information.

21. The method of claim 20, further comprising using feedback information from the encoding to adjust the characteristic of at least one of the filtering and smoothing.

22. An article of manufacture, comprising:
a machine-readable medium having instructions stored thereon to cause a processor to process video data dynamically, by:
filtering high frequency information from at least some video frames having abrupt image changes;
smoothing texture information within object boundaries of an image in the video frames; and
adaptively changing a characteristic, if necessary, of either one or both of the filtering and smoothing in response to a set of criteria.

23. The article of manufacture of claim 22 wherein the instructions for adaptively changing the characteristic of the filtering includes instructions for reducing strength of the filtering as a human visual system adjusts to the image changes.

24. The article of manufacture of claim 22 wherein the instructions for adaptively changing the characteristic of either one or both the filtering and the smoothing includes instructions for changing the characteristic based on at least one of

quantization level, quantization history, motion velocity, changes in scene, number of consecutive frames skipped, and buffer fullness.

25. The article of manufacture of claim 22 wherein the instructions to cause the processor to process video data by adaptively changing the characteristic include instructions to adaptively change a region of support of either one or both of the filtering and smoothing in response to the set of criteria.

26. The article of manufacture of claim 22 wherein the machine-readable medium further includes instructions stored thereon to cause the processor to process video data by:

- maintaining a level of either one or both of the filtering and smoothing if a difference in level changes exceeds a range;

- selecting one of a frame, block, and macroblock granularity to perform either one or both of the filtering and smoothing; and

- adjusting influence of the criteria in the set using weighting factors.

27. The article of manufacture of claim 22 wherein the machine-readable medium further includes instructions stored thereon to cause the processor to process video data by encoding the filtered and smoothed video frames and using information from the encoding to adjust the characteristic.

28. A system for processing video data dynamically, the system comprising:

- a means for adaptively filtering at least some high frequency components from video frames;

- a means for adaptively filtering texture information within object boundaries in an image in the video frames;

- a means for encoding these filtered video frames; and

a means for dynamically adapting a property of either or both of the filterings based on a set of criteria, including feedback information from the encoding.

29. The system of claim 28 wherein the means for dynamically adapting the property includes at least one of a means for adapting a strength and a means for dynamically adapting a region of support, of either one or both of the filterings based on the set of criteria.

30. The system of claim 28 wherein the means for filtering the high frequency components includes a means for filtering these components from at least one of a selectable frame, macroblock, and block granularity.

31. The system of claim 28, further comprising:
a means for using a plurality of weighting factors for at least some of the criteria in the set;
a means for determining whether to increase a strength of the filtering based on whether a difference between old and new filtering strengths is within a range;
a means for performing additional processing to the video frames prior to encoding; and
a means for receiving input video frames and providing output video frames to client devices.

32. An apparatus to process video data dynamically, the apparatus comprising:
a first filter to filter at least some high frequency components from video frames;
a second filter to smooth texture information within object boundaries in an image in the video frames;

an encoder coupled to the first and second filters to encode these filtered video frames; and

a processor coupled to the encoder and to the filters to dynamically adapt a property of either or both of the filters based on a set of criteria, including feedback information from the encoder.

33. The apparatus of claim 32 wherein the processor can dynamically adapt a strength of the filters according to behavior of a human visual system in response to image changes.

34. The apparatus of claim 32 wherein the first filter comprises a low pass filter, and wherein the second filter comprises a non-linear filter.

35. The apparatus of claim 32 wherein at least one of the first and second filters has a programmable region of support.

36. The apparatus of claim 35 wherein the region of support can be dynamically adapted by the processor based on the set of criteria.

37. The apparatus of claim 32 wherein the processor can determine whether to change a strength of the filters based on whether a difference between old and new strengths are within a range.

38. The apparatus of claim 32, further comprising additional audiovideo processing components, at least one transcoder, and a streaming server.

39. The apparatus of claim 32 wherein the filters can be applied to at least one of a selectable frame, block, and macroblock granularity.

40. The apparatus of claim 32 wherein the set of criteria include at least one of quantization level, quantization history, motion velocity, changes in scene, number of consecutive frames skipped, and buffer fullness.

41. The apparatus of claim 40 wherein the processor can apply a weighting factor to each of the criteria in the set to adjust its influence over strengths of the filters.

42. The apparatus of claim 32 wherein the first filter has a strength that can be changed based on an amount of edge information to be filtered from the video frames.

43. The apparatus of claim 32 wherein the second filter has a strength that can be changed based on an amount of texture information to be filtered from the video frames.